

**MISSOURI**  
**PREGNANCY NUTRITION**  
**SURVEILLANCE SYSTEM**



**2002**

Missouri Department of Health and Senior Services

## Missouri Department of Health and Senior Services

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## **EXECUTIVE SUMMARY**

The Pregnancy Nutrition Surveillance System (PNSS) was developed to improve pregnancy outcomes for the portion of the U.S. population that is at highest risk for infant mortality and morbidity. Women living in poverty are at highest risk for poor birth outcomes (infant mortality, physical defects, or developmental impairment). Data are gathered from pregnant and post-partum women during program certification visits required for receipt of benefits from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Data are gathered on characteristics that have been shown to be associated with infant mortality and morbidity such as mother's age, race/ethnicity, prepregnancy body mass index (BMI), gestational weight gain, low hemoglobin concentration, smoking behavior, smoking in the household, prenatal care, and time of entry into WIC. Long-term trends of rate of infants born with at-risk birthweight, full-term low birthweight, and preterm labor among WIC participants are monitored to guide development and revision of public health interventions.

This report provides:

- Prevalence rates of poor birth outcomes (birthweight and gestational age).
- Nutritional status and prevalence rates of risky behaviors of low-income pregnant women by maternal race/ethnicity and age.
- Demonstration of progress toward the Healthy People target rates for 2010.

Surveillance results of 2002 present an optimistic picture for reaching two of the Healthy People 2010 goals: increasing prenatal medical care and reducing premature births.

### **Maternal Demographic Characteristics**

The population of WIC participants included in the PNSS report for 2002 was made up of 66.7% White, 21.9% Black/African-American, 4.7% Hispanic, 0.2% American Indian/Native Alaskan, 1.0% Asian/Pacific Islander, and 5.5% Other/Unknown. Both prenatal and post-partum care was provided for 71.8% of 43,699 WIC mothers participating. Missouri has continued to provide essential services to at-risk mothers: 24.3% were less than 20 years old and 15.5% were over 30 years old. Pregnancy among teens has been decreasing and pregnancy among older women has been increasing in Missouri WIC.

### **Maternal Behavioral and Nutritional Health Indicators**

#### ***Prenatal Medical Care:***

Early prenatal care benefits mother and infant. The target rate for prenatal care for 'Healthy People 2010' is for 90% of live births to have entered adequate prenatal care during the first trimester. In 2002, 73.2% of Missouri WIC participants received prenatal medical care during the first trimester. Fewer Black/African-Americans (9.0%) or Asian/Pacific Islanders (10.4%) reported receiving no prenatal care than White (17.3%), Hispanic (15.6%), and Other/Unknown (16.8%) races/ethnicities.

An increase of 3.6% was observed in “Enrollment in WIC during the first trimester” over 2001. In contrast to prenatal medical care, women of White (45.1%), Hispanic (38.6%), and Other/Unknown (35.1%) races/ethnicities tended to enroll in WIC during the first trimester at a higher rate than Black/African-American (B/AA 29.5%) and Asian/Pacific Islanders (A/PI 29.0%), who tended to enroll in WIC later.

### ***Prepregnancy Weight Status:***

Underweight and overweight prepregnancy weight status of the mother has been linked to premature birth.<sup>1</sup> In 2002, 44.0% of the WIC participants in Missouri had a normal BMI. Asian/Pacific Islander (31.1%) women in Missouri-WIC tended to be underweight rather than overweight, whereas all other races/ethnicities tended to be overweight.

### ***Gestational Weight Gain:***

Weight gain channels specify the appropriate range of gestational weight-gain (“Ideal Weight Gain”) for each BMI category. The baseline for this measure was estimated to be at 75% for the United States, though a target rate for 2010 has not been set.<sup>2</sup> Weight gain differed among the prepregnancy BMI categories. Women of normal and overweight prepregnancy BMI were more apt to gain ‘Greater than ideal weight’ than women with an underweight prepregnancy BMI. Among the races/ethnicities, ‘Greater than ideal weight gain’ was more prevalent among Whites (45.7%), while ‘Less than ideal weight gain’ was most prevalent among Asians/Pacific Islanders (28.1%). More Asian/Pacific Islander (44.8%) and Hispanic (38.0%) women were within the ideal weight gain channel than White (33.7%) or Black/African American (33.9%) women. Among age groups, ‘less than ideal-weight gain’ was more common among women aged 30 and older than for other age groups.

### ***Low Hemoglobin:***

Low Hemoglobin (Hb) concentration in the blood affects the delivery of oxygen to the growing fetus. Low Hb has been shown to be associated with poor birth outcomes such as low birthweight, premature delivery, fetal death, and fetal growth retardation. Though the demands of pregnancy and delivery predispose pregnant women to low Hb, good nutrition can expedite recovery. The Healthy People target rate for 2010 is to reduce low Hb rates to 20% of pregnant women in their third trimester. Missouri has a higher rate of low Hb (36.2%) than the Nation during the third trimester (30.6%), though postpartum low Hb rates were lower (MO 27.1%, Nation 35.0%).

The rate of low Hb during the third trimester was between 21.2 and 23.3 percentage points (67.7% to 79.8% difference) higher for Black/African-American women than for women of other races/ethnicities. The rate of low Hb for Black/African-American women postpartum exceeded other races/ethnicities by 19.1 to 26.4 percentage points (65.9% to 122% higher).

### ***Cigarette Smoking:***

Cigarette smoking can have detrimental effects on the fetus, including cessation of growth in-utero and physical defects. An aggressive goal has been set for 2010. The Healthy People 2010 target rate is to increase the rate of cessation during the first trimester from a baseline of 14% in 1998 to 30% in 2010. This will be a challenge for Missouri. Though the National rate has changed significantly, the cessation rate for Missouri has remained constant since 1998. Nearly 40% of Missouri women in WIC smoke prior to pregnancy. Furthermore, Missouri ranks among the lowest rates for cessation among the states/tribes. White women

(32.1%) contribute more to the elevated smoking rates observed in Missouri-WIC than other races/ethnicities. White women smoke during pregnancy at more than twice the rate as other races/ethnicities, and fewer quit (24.6%). White women allow smoking within the household at twice the rate of other races/ethnicities during both prenatal (46.2%) and postpartum (37.3%) periods. Older women tend to continue smoking during pregnancy (31.2%).

## **Birth Outcomes**

### ***High Birthweight:***

High birthweight (HBW) infants (i.e., greater than 4,000g or 8 lbs. 12 oz.), have greater morbidity and injuries than normal weight infants because of the difficulty of the birth. The 2010 goal for reducing high birthweight infants among mothers is 4.1%. High birthweight infants occur in the Missouri PNSS population at the same rate as in the Nation's (7.5%) PNSS population. High birthweight has been declining steadily for the Nation and for Missouri. High birthweight was more prevalent among Hispanic (9.1%), White (8.3%), and Other/Unknown (8.5%) than Black/African-American (4.7%) or Asian/Pacific Islander (4.6%) races/ethnicities. High birthweight infants were also born more frequently to women 30-39 years old (10.5%).

### ***Low Birthweight:***

One of the strongest predictors of infant survival is birthweight. The Centers for Disease Control and Prevention (CDC) define low birthweight (LBW) as below 2,500g, (i.e., 5 lbs. 8 oz.). The target rate for Healthy People 2010 is to reduce the rate of low birthweight births to 5.0%. Only five states/tribes in the Nation's PNSS surveillance have higher rates of LBW infants than Missouri-WIC. Low birthweight has remained at a relatively stable rate of prevalence among Missouri WIC participants over the past 3 years. Low birthweight was most prevalent among women under 20 years of age (21.8%), women over 39 (12.7%), Black/African-American women (12.3%), and smokers (9.7%). About half of the low birthweight infants were delivered at full-term (3.7%).

### ***Prematurity:***

By 2010, the Healthy People target is to reduce the rate of premature births from 11.6% observed in 1998 to 7.6% (40.6% decrease). Rates of premature births in Missouri's WIC population exceed the Healthy People baseline. Premature births occur among PNSS populations at a rate of 12.8% in Missouri and 11.2% in the Nation.

## **Conclusions and Recommendations**

Encouraging trends in the health of Missouri PNSS participants in WIC include decreases in four health indicators: underweight prepregnancy BMI, postpartum low Hb, and pregnancy among teens (15 to 17 years old).

Two of the Healthy People 2010 targets are within reach. Prenatal medical care would need to increase 2.1 percentage points on average each year and premature births would need to decrease 0.6 percentage points on average each year. In 2002, prenatal medical care increased an

average of 1.2 percentage points each year during the past 5 years. The rate of premature births has fluctuated an average of 0.4 percentage points each year during the past 5 years.

Because 40% of WIC participants are under 20 years old and over 30, i.e., at highest risk for infant mortality and morbidity, prenatal care is very important to Missouri-WIC. Referrals between WIC and medical facilities would ensure proper monitoring and nutritional and educational support for high-risk women.

Premature births are 5.2 percentage points above the target, requiring a 40.6% decrease. Three factors have been cited that influence premature birth – mother's age, prepregnancy BMI, and low Hb. Though WIC has the means to make a difference in the level of low Hb among women, trends of the other two factors may slow progress. Although teen pregnancies are declining, pregnancies among older women are increasing. Older women are more likely to smoke during pregnancy, more likely to have overweight/obese prepregnancy BMIs, more likely to have multiple births, and more likely to gain less than ideal weight. This combination results in a tendency to have infants that are premature, low birthweight, and with medical complications.

Current WIC programs can continue to assist older mothers by screening for anemia and providing healthy foods, by emphasizing the importance of adequate weight gain, and by encouraging smoking cessation. Further efforts may be needed to reach older women during the first trimester of pregnancy and to assist the population in maintaining healthy weight status in preparation for pregnancy.

## INTRODUCTION

The Pregnancy Nutrition Surveillance System (PNSS) was developed to assist allied health agencies in identifying and reducing health risks that contribute to adverse pregnancy outcomes. Its purpose is to provide useful and timely data that will allow state health agencies to monitor trends in the prevalence of prenatal risk factors that are predictors of infant mortality, infant morbidity, and low birthweight. State and federal governmental health agencies work in concert to promote good nutrition, good prenatal care, and responsible maternal behaviors among the “high risk population”.

The Centers for Disease Control and Prevention (CDC) takes the position that by educating and providing nutritional support to pregnant mothers most at risk, mothers will adopt behaviors and diets that will result in fewer infant mortalities, fewer infants of low birthweight, and fewer infants with birth and developmental abnormalities. Besides nutrition, factors associated with the prevalence of infant mortality and low birthweight include socioeconomic level, education level, age, race, and ethnicity of the mother. Between 35% and 40% of all children born in Missouri are born to families with incomes at or below 185% of the poverty level<sup>3</sup>.

In Missouri, the information for the PNSS is collected through the administration of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). During certification and recertification for the program, mothers are interviewed and screened for low hemoglobin, and height and weight measurements are taken. The women provide information on their diet, breastfeeding practices, race/ethnicity, smoking behavior, household exposure to cigarette smoke, previous pregnancies, and prenatal care. Based upon evaluation of the information, a health professional for the WIC program prescribes foods, suggests changes in diet, educates the client, and refers clients for medical care or substance cessation counseling as needed. The anthropometric and behavioral data collected are reported to CDC for collation in PNSS. The national program specifically represents women and infants living near the poverty level participating in any number of state or federal programs. In 2002, 40,574 records from the Missouri WIC program were analyzed by CDC for the PNSS: 3,543 (8.7%) prenatal-only records, 7,919 (19.5%) postpartum-only records, and 29,112 (71.8%) prenatal through postpartum records.

The PNSS report is used by health agencies to track long-term trends and to plan programs. In this way, federal and state public health agencies work in concert to improve the health and development of children most at risk. Healthy People 2010 target rates are the goals for improving the health of all Americans in the United States (U.S.). Healthy People 2010 target rates are presented to provide a frame of reference of health standards that all programs strive toward.<sup>4</sup> However, the PNSS reports present rates of health indicators of a very specific population, defined by the requirements of participation in the WIC program and others requiring income and health risk guidelines. The target rates for Healthy People 2010 are for the general population, except for anemia which has a target for food stamp recipients, (i.e.,  $\leq 130\%$  of the poverty level).



## Improvements CDC has made for 2002 PNSS

Each year, CDC strives to improve the quality and presentation of PNSS data. For the 2002 data summary, the following items have been added:

- three demographic categories: % poverty level, program participation (Medicaid, WIC, TANF, etc.), and migrant status;
- six new health indicators: parity, interpregnancy interval, quit smoking by first prenatal visit, quit smoking by first prenatal visit and stayed off cigarettes, smoking in the household, and full term low birthweight;
- three new trend analyses: race/ethnic and age distribution, maternal health and behavioral indicators, and infant health indicators;
- cross-tabulation of maternal weight gain and birth outcomes by select health indicators.

Data quality has been improved by:

- adopting new pregnancy trimester cutoffs;
- new Biologically Invalid Value cutoffs for birthweight and gestational age (Table 1);
- routines for recoding alcohol consumption and WIC enrollment data.

Table 1. Data quality improvements made by the Centers for Disease Control and Prevention for 2002.

Category that has been Changed	New 2002	Old
<b>Pregnancy Trimesters</b>		
1 <sup>st</sup> Trimester	0-93 days	15-89 days
2 <sup>nd</sup> Trimester	94-187 days	90-179 days
3 <sup>rd</sup> Trimester	188 or more days	180-325 days
<b>Records Excluded from Analysis</b>		
Gestational Age	<20 weeks	< 25 weeks
Birthweight	<8 ounces	<1 pound 1 ounce
<b>Hematocrit (Hct) Cutoffs for Nonpregnant women</b>		
12- <15 years	35.7	35.5
15-17.9 years	35.9	36.0
> 18 years	36.0	35.7

Some of the tables formerly provided by CDC were not available this year due to reorganization of the table formats, among them, information on drinking behaviors and marital status were omitted. A table for drinking behaviors may be available next year. The results presented are crude rates and have not been standardized for comparison.

The 2002 data report from CDC was based on nearly 3,000 fewer participants than actual participants visited WIC clinics in Missouri. The effect of this discrepancy on the results is

largely unknown. Where possible, the results tabulated for 2002 within the trend analyses of the 2003 report were used in this report.

## Areas Contributing to National Surveillance

The results presented in this report represent that of the participants in the PNSS programs and are not to be interpreted as representing the population of Missouri or the nation as a whole. Results will be presented for the PNSS program populations for the nation and for the state of Missouri. In this report, the “Nation” (or nationally) refers to the results CDC has aggregated from 21 states and 3 tribes/tribal councils (tribes) that participated in the Pregnancy Nutrition Surveillance System in 2002 (Fig. 1).

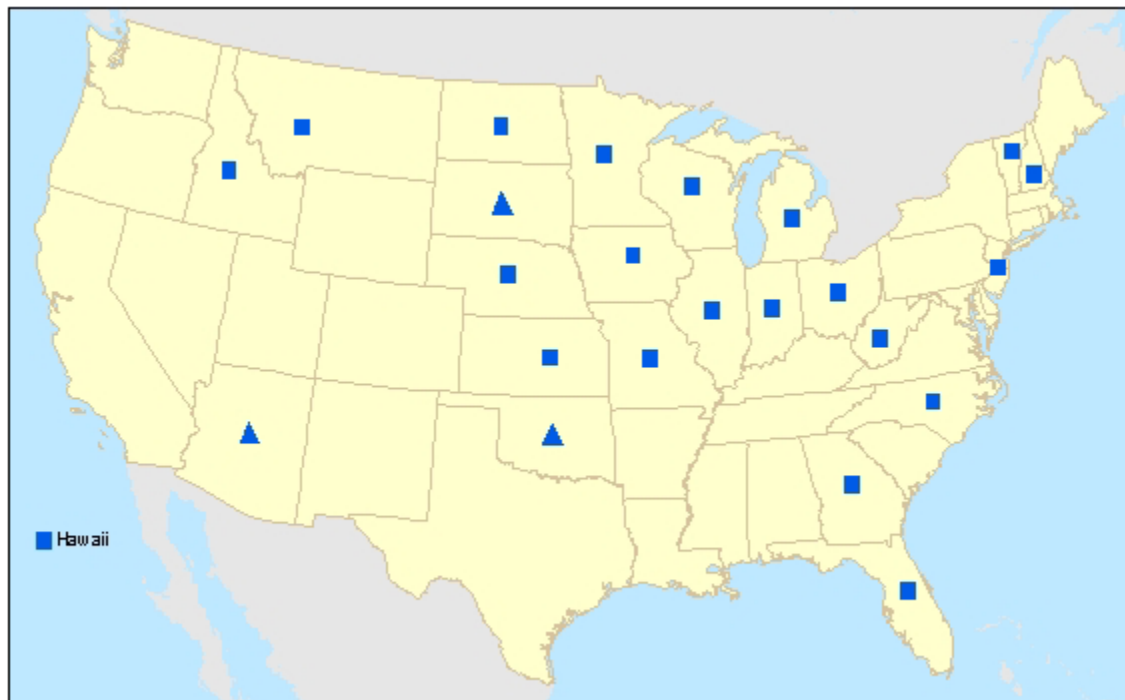


Figure 1. Twenty-one states (■) and three tribes/tribal councils (▲) participated in the Pregnancy Nutrition Surveillance System in 2002. (Source: CDC PNSS report 2002 Table 3D).

## Demographic Characteristics of the Surveillance

## Socioeconomic Status

The majority (66.6%) of the participants in the 2002 PNSS in Missouri were at or below 100% of the Poverty Level (Fig. 2). The socioeconomic distribution of Missouri participants were nearly identical to that of the Nation. Of the Missouri participants, 22.9% were also recipients of Temporary Assistance for Needy Families (TANF) benefits and 27.1% were also recipients of food stamps. All (100%) received WIC benefits.

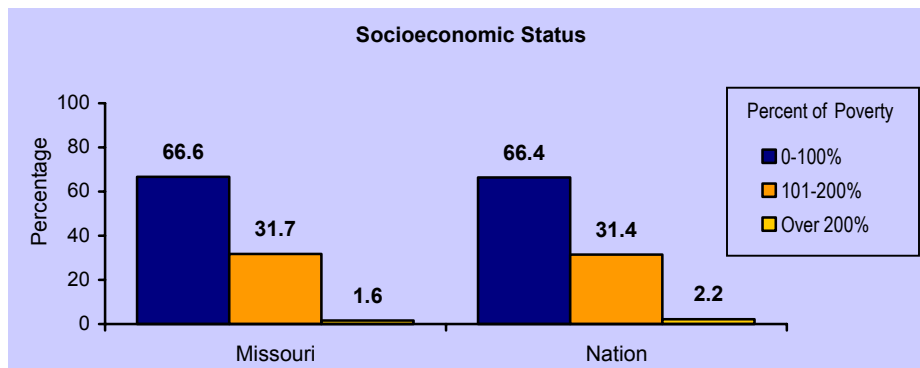


Figure 2. Proportion of the PNSS population by household income (percent of the poverty level, or adjunct eligible) (Missouri  $N=40,524$  (50 unknown), Nation  $N=648,331$  (79,484 unknown)). (Source: CDC PNSS report 2002, Tables 1C, 1D).

### Race and Ethnicity

The racial and ethnic composition of the WIC population in Missouri consisted of more White and 'Other/Unknown' races/ethnicities than the Nation overall (Fig. 3).

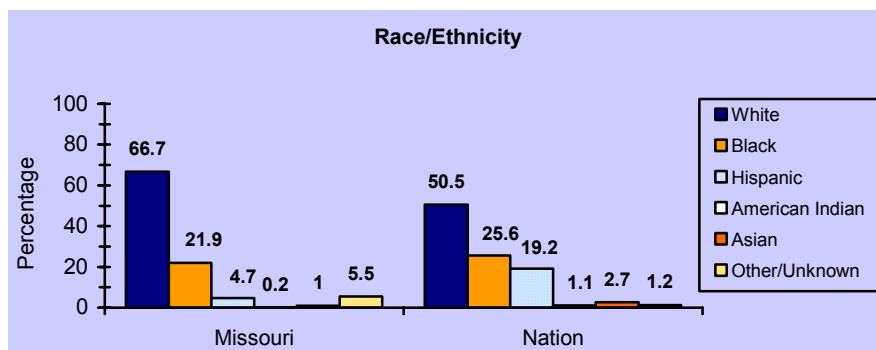


Figure 3. Racial/ethnic composition of the population participating in WIC in Missouri as well as for the nationwide PNSS survey. (Source: CDC PNSS report 2003 Table 3C).

### Age

Little difference was evident in the distribution of age groups of pregnant women between the surveyed populations of the state of Missouri and the Nation (Fig. 4). The majority of pregnant women participating in WIC are between 20 and 29 years old. For most of the women (41.4%) this was their first pregnancy. The pregnant women in Missouri tend to be somewhat younger than the Nation. Participation among teens in Missouri has shown a declining trend over the past 3 years (Fig. 5).

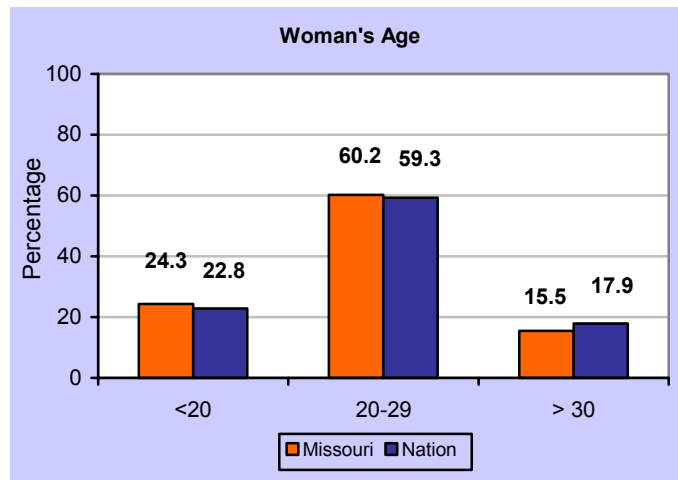


Figure 4. Distribution of age groups of pregnant women in WIC for the state of Missouri and the Nation. (Source: CDC PNSS 2003 report Table 15C, CDC PNSS 2002 Table 4E).

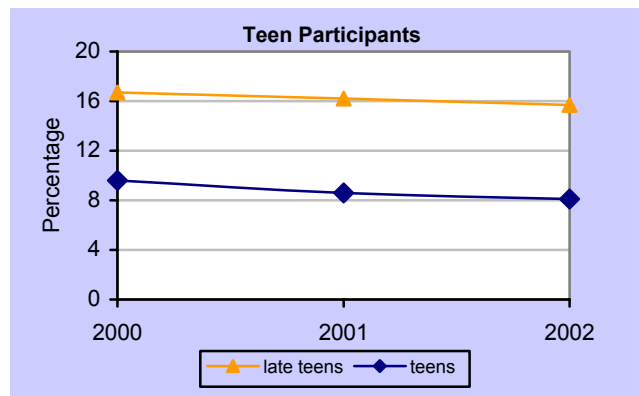


Figure 5. Participation of teens (15-17 years old) and late teens (18-19 years old) in WIC services for the state of Missouri from 2000 to 2002. (Source: CDC PNSS report 2003, Table 15C).

## Education

Most participants in the PNSS (63.9%) have attained at least a high school education (Fig. 6). Based on the ages of women in WIC in Missouri, around 12% would not be expected to have attained a high school diploma at the time of certification.

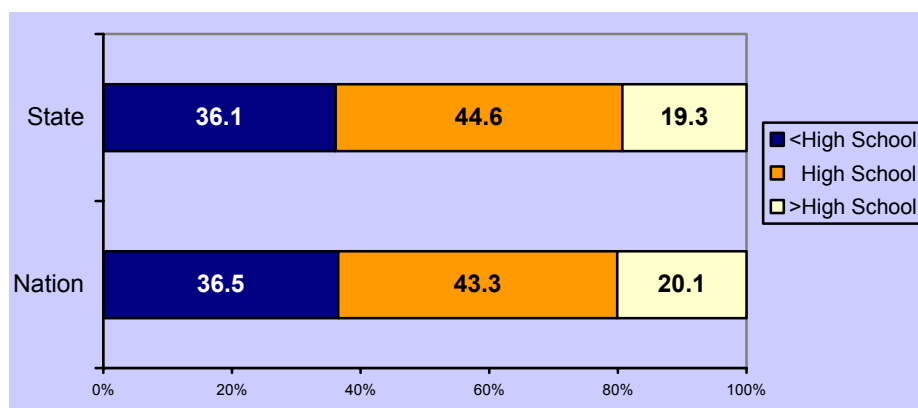


Figure 6. Education level of PNSS participants in Missouri WIC and the Nation.  
(Source: CDC PNSS 2002 report Table 2C, 1D).

## MATERNAL HEALTH

Risk of infant mortality is related to the underlying health of the mother, availability and use of appropriate health care for infants and pregnant women, and socioeconomic conditions<sup>2</sup>. The WIC program in Missouri takes proactive measures to reduce the incidence of low birthweight and premature delivery of infants. Through WIC, local public health agencies and other WIC providers in Missouri accomplish these goals through monitoring mothers' diets, monitoring their gestational weight gain in relation to their prepregnancy body mass index (BMI), monitoring them for low hemoglobin, referring them to prenatal care and other medical professionals, and providing personalized education to prepare mothers with the knowledge required to make healthy choices in breastfeeding, infant care, and nutrition.

### Maternal Behavioral and Nutritional Health Indicators

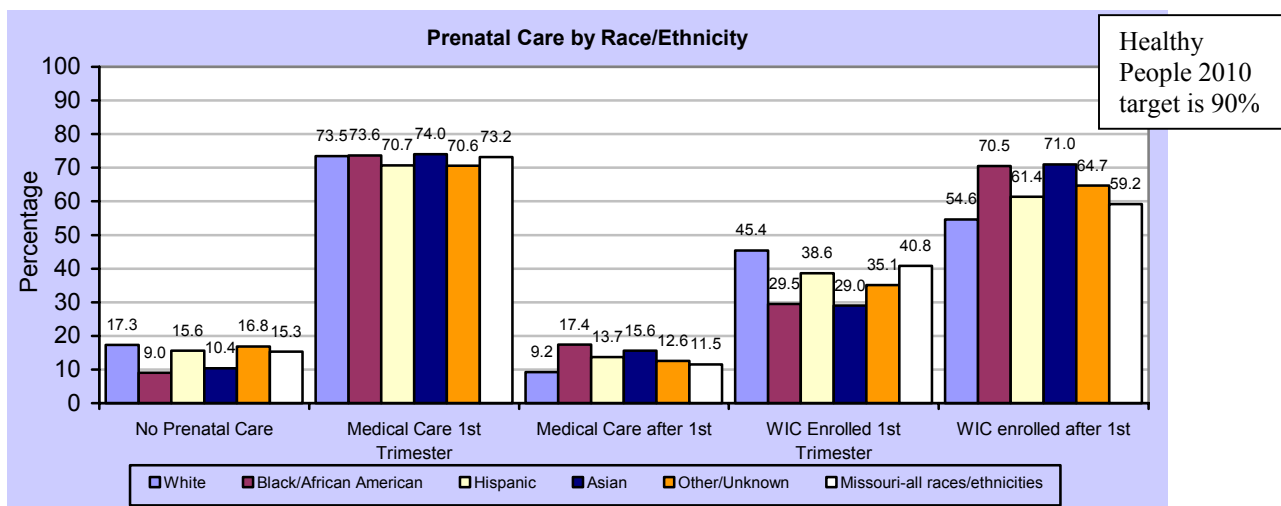
#### Prenatal Care among WIC Participants

The goal of prenatal medical care is to identify health conditions and address them prior to their becoming a problem for the mother or the fetus. Blood pressure tests and tests detailing the functioning of the liver and pancreas are an important part of prenatal care. These tests screen for diabetes and preeclampsia which compromise circulation of blood to the fetus.<sup>5</sup> Prenatal care is particularly important for mothers under 20 and over 35 years of age. In Missouri, these at-risk age groups made up about 40% of the women in WIC in 2002.

The health of the pregnancy is dependent on the health and nutrition of the woman. Pregnancy places a great burden on the woman's body. The body prepares far in advance of its need. Thus, nutrition and prenatal care are important throughout pregnancy. The WIC program assesses the nutritional health, gestational weight gain, and medical needs of pregnant women upon certification, and issues bimonthly "food instruments" for foods providing the additional nutrients needed. WIC also provides nutritional education and medical referrals.

Of the women in Missouri who sought medical care, the distribution between first and later trimesters was about the same regardless of race/ethnicity (Fig. 7). More White, Hispanic, and Other/Unknown races/ethnicities were without prenatal care than Black/African-Americans (Black/AA) or Asians/Pacific Islanders (Asian/PI). White, Hispanic and Other/Unknown also entered WIC during the first trimester at a higher rate than Black/AA or Asian/PI who tended to enroll in second or third trimesters.

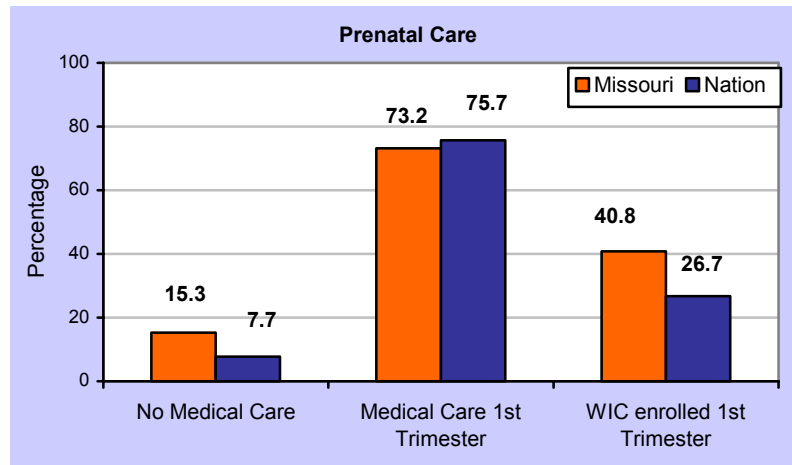
The rate of prenatal care among women during the first trimester in the United States in 1998 was 83%. The target rate for Healthy People 2010 is 90%. The overall rate of prenatal care- first trimester for women enrolled in WIC in Missouri (73.2%) in 2002 was well below both the target and the baseline for the U.S. - Healthy People 2010.



\*Insufficient number to determine a reliable estimate for American Indian/Alaskan Native.

Figure 7. Percentage of women on WIC in Missouri using prenatal and nutrition services are listed by race/ethnicity and overall for the state. The Healthy People Target rate for 2010 is for 90% of pregnant women to receive prenatal care during the first trimester. (Source: CDC PNSS 2003 Table 21C).

Prenatal Care of women participating in WIC differed between Missouri and the Nation. More pregnant women in Missouri-WIC (15.3%) never sought prenatal care in 2002 than did nationally (7.7%)(Fig. 8). Although the rate of 'no care' is declining nationally, the rate in Missouri-WIC has remained fairly steady for at least 3 years.



\* Year 2010 target: 90% of pregnant women will enter into medical care during the first trimester.

Figure 8. Percent of women reporting No Medical Care, Medical care during the first trimester, and surveillance and assistance in the WIC program during the first trimester. (Source: CDC PNSS report 2002 Tables 2C, CDC PNSS report 2003, Table 17C).

### Prepregnancy Weight Status

As an indicator of nutritional health, the woman's weight status is determined using BMI. Weight and height of the woman prior to pregnancy are used to calculate the BMI. Underweight is defined as BMI < 19.6 and overweight is determined as BMI > 26.0 based on 1990 Institute of Medicine report, "Nutrition During Pregnancy"<sup>6</sup>. CDC combines women into categories of Obese and Overweight when analyzing prepregnancy BMI.

A significant linear relationship has been reported between prepregnancy weight and birthweight, independent of weight gain during pregnancy<sup>7</sup>. Underweight as well as overweight and obese weight status before pregnancy is associated with preterm labor resulting in premature birth. Other characteristics associated with women who give birth prematurely are diverse including being less than 17 years of age, being over 35 years of age, lacking social support, and having abnormalities of the uterus and cervix<sup>8</sup>. Prepregnancy overweight has a significant independent effect on birthweight, with the incidence of high birthweight (macrosomia) increasing with prepregnancy weight. High birthweight infants have an increased risk of perinatal morbidity and mortality.

In 2002, 56.0% of participants in Missouri-WIC were reported to be in the risk categories based on prepregnancy BMI (13.8% Underweight, 42.2% Overweight/Obese). Underweight prepregnancy BMI has been decreasing steadily over the past 3 years (13.8% from 14.8%; 2002 to 2000 respectively) while Overweight prepregnancy BMI has steadily increased (40.9% to 42.2%; 2000 to 2002 respectively).

Asian/PI women in Missouri tended to be underweight rather than overweight, whereas all other races/ethnicities tended to be overweight (Fig. 9).

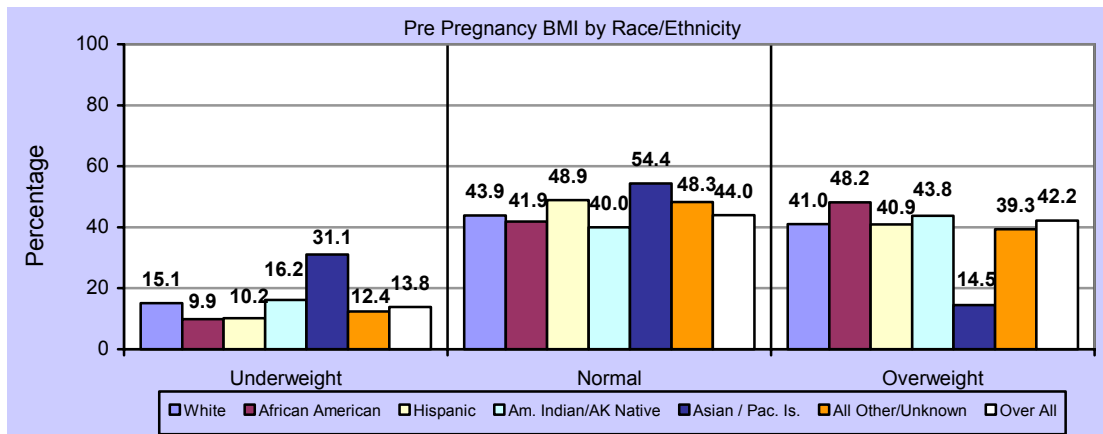


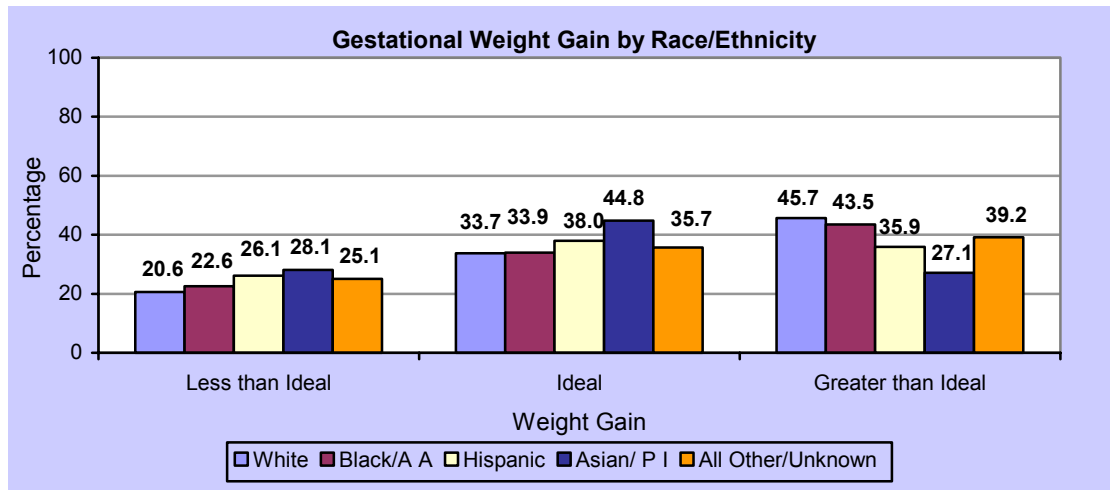
Figure 9. Percent of women by Prepregnancy BMI group and race/ethnicity. (Source: CDC PNSS report 2003, Table 20C).

### Gestational Weight Gain

Studies have shown that inadequate gestational weight gain results in increased risk of neurological impairment of the infant, low birthweight, and fetal death<sup>1</sup>. The Institute of Medicine now recommends weight gain channels (minimum and maximum weight gain for each week of gestation) based on the mother's prepregnancy BMI and gestation. The following weight gain channels are considered "Ideal Weight Gain" (Ideal): women with an Underweight BMI should gain 28-40 pounds; women of normal BMI should gain between 25 and 35 pounds, and women with an overweight or obese BMI should gain 15-25 pounds during the pregnancy<sup>10</sup>. Women who gain less than the ideal weight are at higher risk of having premature and low birthweight infants. Women who gain more than the recommended weight are more likely to have a high birthweight infant. Women who gain greater than ideal weight may have a more difficult delivery and more difficulty losing weight following delivery<sup>9</sup>. "About 14% of low-birth-weight births in the United States can be attributed to inadequate gestational weight gain"<sup>10</sup>.

'Less than ideal-weight-gain' was most common among Asian/PI women (28.1%) (Fig.10). 'Greater than Ideal-weight-gain' was most common among White women (45.7%).





\*Insufficient number to determine the rate for American Indian/Alaskan Native ( $n=69$ ).

Figure 10. Percent of women attaining Ideal weight-gain by race/ethnicity ( $N=43,307$ ). (Source: CDC PNSS report 2003, Table 20C).

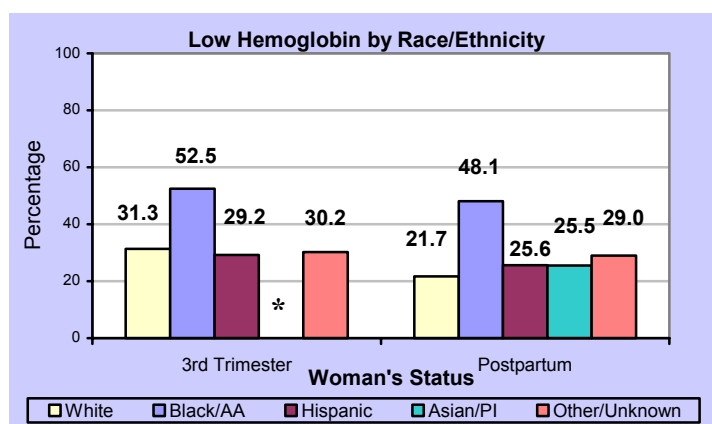
### Low Hemoglobin

Anemia is the condition of having a lower proportion of red blood cells composing the blood volume. The hematocrit and hemoglobin concentrations are used as indicators of iron deficiency. Iron deficiency is the most common form of nutritional deficiency in the U.S. and presents often among low-income women during pregnancy despite headways made for other segments of the population. Iron is present in all cells and has several vital functions including: carrying oxygen, facilitating use and storage of oxygen, transporting electrons in cells, and facilitating enzyme reactions. About 20% of the iron in the body is stored in the liver and 80% is carried in the blood stream and tissues. When iron from the diet is insufficient, the iron stored in the body is removed. Eventually the generation of red blood cells is hindered resulting in reduced cell volume in the blood and morbidity ensues<sup>11</sup>.

Anemia is most common among adolescent women, women of childbearing age, and pregnant women. Adolescence (12-18 years of age) is a period of rapid growth, which predisposes teens to elevated requirements for iron and hence low hemoglobin. Additionally, female bodies must continually compensate for monthly menstrual blood loss. During the first two trimesters of pregnancy, a woman is prone to low hemoglobin due to the drastic increase in blood volume. During the second and third trimesters, the rapid growth of the fetus, placenta, and maternal tissues increases the demand for iron three-fold. Pregnant women with iron-deficiency anemia have a two-fold increase in risk for a premature delivery and a three-fold increase in risk for delivering a low birthweight infant. Postpartum anemia results from loss of blood, fetus, and placenta during delivery. Other causes of low hemoglobin include nutritional deficiencies (iron, folate, B<sub>12</sub> deficiency), hereditary defects in red blood cell production (thalassemia major and sickle cell disease), recent or current infection, and chronic inflammation<sup>11</sup>.

Hemoglobin (Hb) concentration and packed red blood cell volume (i.e., hematocrit (Hct)) are used in public health screenings to detect anemia. These indicators are affected by altitude, smoking, and race. Distributions of the Hb and Hct measurements are significantly lower for Black/African-Americans, even after adjustment for income<sup>11</sup>.

More Black/African-American women in Missouri were found to have low Hb during the third trimester and postpartum than the other races/ethnicities (Fig. 11, Fig. 12). Prevalence of low hemoglobin was significantly lower postpartum than during the third trimester for Whites and Black/African-American women (Two-Sample Test for Proportions,  $z=1.96$ ,  $\alpha=0.05$ ).



\*Insufficient data to provide a reliable estimate of the rate for American Indian/Alaskan Native and Asian/PI.

Figure 11. Percent of women with low hemoglobin during the third trimester of pregnancy ( $N=5,454$ ) and postpartum ( $N=9,166$ ) in Missouri by race/ethnicity. (CDC PNSS report 2003, Table 20C).

The rate of low hemoglobin during the third trimester has been increasing among White women in WIC (Fig. 12). The rate of low hemoglobin during the third trimester is lower this year than last for all other races/ethnicities. Over all the rate of low hemoglobin among women during their third trimester has been increasing, while the postpartum rate has been steady (Fig. 13).

Low hemoglobin is a particular problem among the Missouri WIC population. Only three states/tribes have higher rates of low hemoglobin during the third trimester of pregnancy than the Missouri WIC group (Fig. 14).

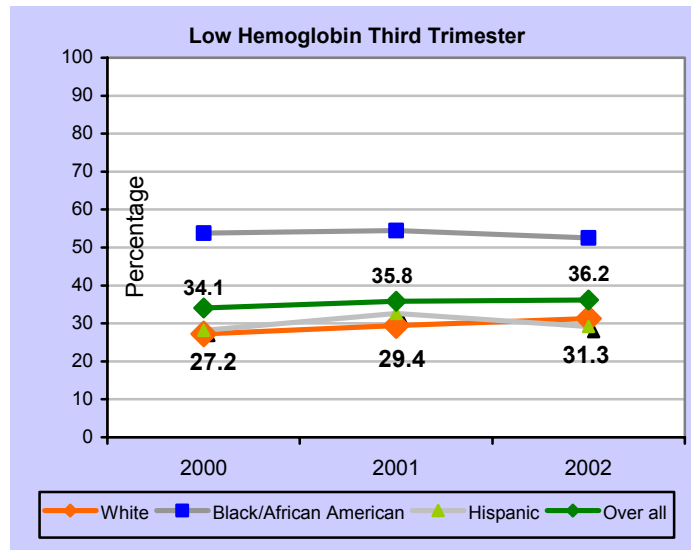


Figure 12. Three-year trend of percent of women with low hemoglobin during the third trimester of pregnancy in Missouri by race/ethnicity. (Source: CDC PNSS report 2003, Table 20C).

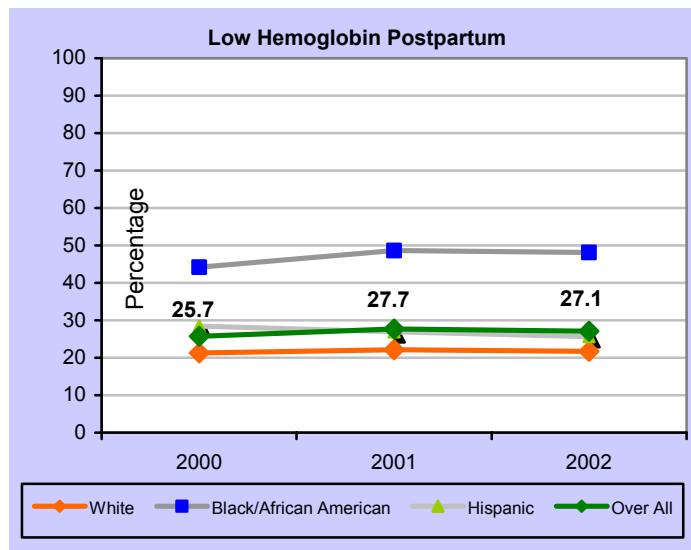


Figure 13. Three-year trend of percent of women with low hemoglobin postpartum in Missouri by race/ethnicity. (Source: CDC PNSS report 2003, Table 20C).

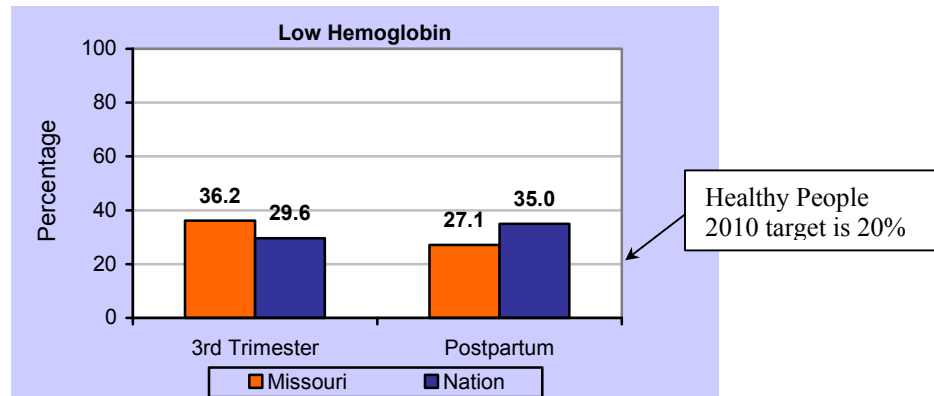
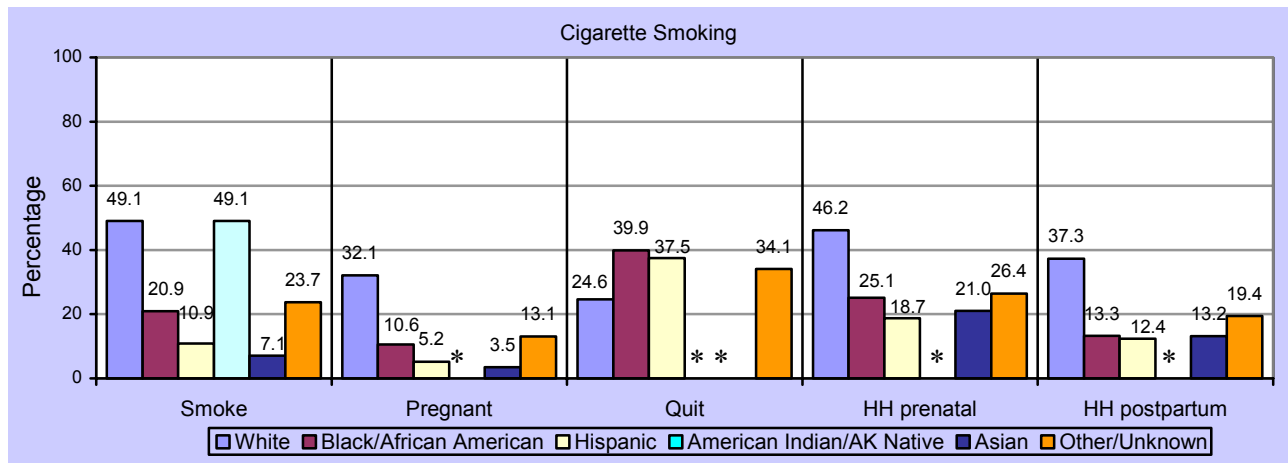


Figure 14. Percent of women exhibiting low hemoglobin during the third trimester of pregnancy and postpartum in Missouri and the Nation in 2002. The Healthy People 2010 target for women in third trimester of pregnancy with income of  $\leq 130\%$  of poverty level, is 20.0%. (Source: CDC PNSS report 2003, Table 20C, CDC PNSS report 2002, Table 2C).

### Cigarette Smoking

Cigarette smoking and smoking in the household are associated with increased risk of birth defects, higher infant morbidity, and higher infant mortality. Smoking has been associated with infertility, miscarriages, tubal pregnancies, infant mortality and childhood morbidity<sup>12</sup>. A pregnant woman who smokes is between 1.5 and 3.5 times more likely than a nonsmoker to have a low birthweight infant. Infants whose mothers smoke during pregnancy and after birth are 3 times more susceptible to Sudden Infant Death Syndrome (SIDS)<sup>13</sup>. Some birth defects may occur at increased frequency to infants whose mother smoke: cleft lip, cleft palate, clubfoot, limb defects, some types of heart defects, gastroschisis, and imperforate anus<sup>14</sup>.

White women contribute more to the elevated smoking rates observed in Missouri-WIC participants than other races/ethnicities. White women smoke during pregnancy ( $n=26,644$ ) at more than twice the rate as other races/ethnicities, and fewer quit. White women allow smoking within the household at twice the rate of other races/ethnicities (Fig. 15). Fortunately, the rate of households with smokers after the birth has been exhibiting a decreasing trend over the last three years (Fig. 16).



\*Insufficient data to provide a reliable estimate of the rate.

Figure 15. Comparison of race/ethnicity among women in Missouri-WIC who smoked before pregnancy ("Smoke", above), smoked during pregnancy ("Pregnant", above), Quit smoking before the first prenatal visit ("Quit", above), allowed smoking in the household while she was pregnant ("HH prenatal", above) and allowed smoking after delivery ("HH postpartum", above). (Source: CDC PNSS report 2003, Table 22C).

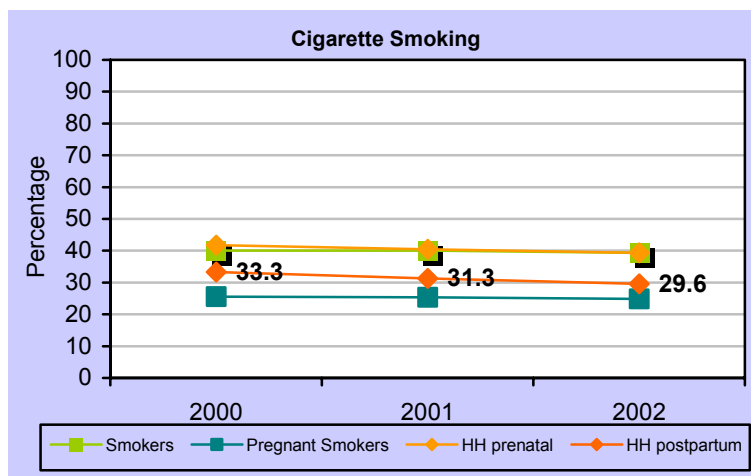


Figure 16. Comparison of rates of behaviors related to smoking that place pregnant women in Missouri at risk of poor birth outcomes, from 2000 to 2002. Smoking cigarettes before pregnancy ("Smokers", above), smoking during pregnancy ("Pregnant Smokers", above), allowing smoking in the household while she was pregnant ("HH prenatal", above) and allowing smoking in the household after delivery ("HH postpartum", above). (Source: CDC PNSS report 2003, Table 18C).

## Alcohol Use

CDC did not compile rate of consumption of alcohol during pregnancy among WIC participants in Missouri for 2002.

## INFANT HEALTH AND MORBIDITY

Birthweight and gestational age are the two most important predictors of the subsequent health and survival of an infant<sup>19</sup>. Short-gestation, low birthweight and congenital malformations are the leading causes of death during the first month of life<sup>2</sup>.

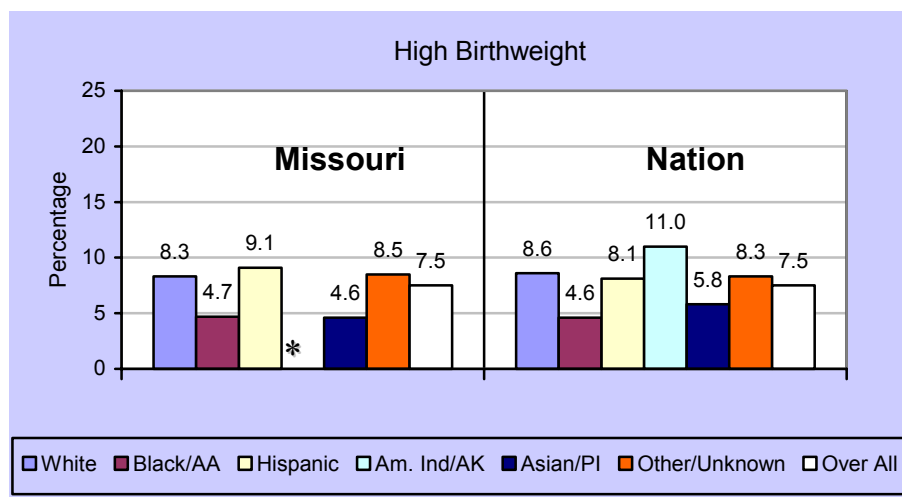
### Birth Outcomes

#### High Birthweight

An infant is born with high birthweight (macrosomia) if he/she weighs over 4,000 g (8 lbs. 12 oz.). A high birthweight infant may suffer a more difficult delivery, (i.e., shoulder dislocation), and has an increased risk of perinatal morbidity and mortality<sup>6</sup>.

High birthweight occurs among Missouri-WIC participants at about the same rate as it does in the Nation (7.5%) and is less prevalent than low birthweight (8.3%). High birthweight among program participants has been declining steadily for the Nation (7.5% from 8.2%, 2002 from 2000, respectively) and for Missouri (7.5% from 7.8%, 2002 from 2000, respectively).

Infants with at-risk birthweight were observed to differ among mothers based on race/ethnicity and mother's age. High birthweight was more common among White, Hispanic, and Other/Unknown than among Black/African-American or Asian races/ethnicities (Fig. 17).



\*Insufficient records available to provide a reliable estimate for American Indian/Alaska Native in Missouri.

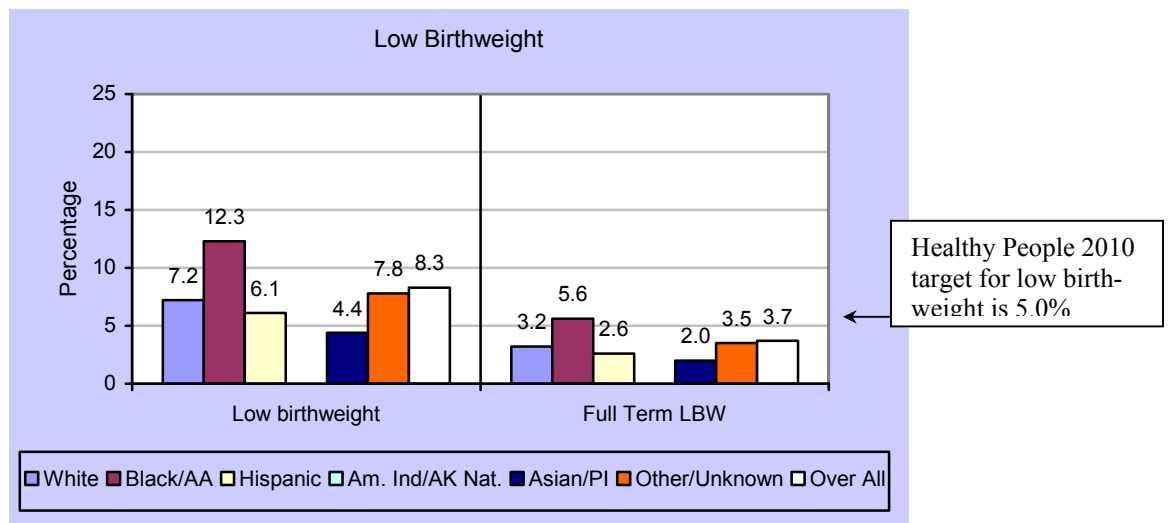
Figure 17. Percentage rate of high birthweight by race/ethnicity for Missouri and the Nation. (N=38,598) (Source: CDC PNSS report 2003, Tables 23C; CDC PNSS report 2002 Table 12D). (Please note, scale has been truncated.)

## Low Birthweight

Only five states/tribes in the Nation (PNSS population) have more low birthweight infants than Missouri-WIC participants. Low birthweight is a factor in 65% of the infant deaths in the United States. Low birthweight results from a period of reduced or halted intrauterine growth. It may be a result of a health condition or nutrition of the mother (uterus fails to grow properly, placenta fails to function properly, kidney or lung disease, preeclampsia, twins), the mother's behavior (smoking), or the mother's age. Low birthweight infants are more likely to have health problems during the first months of life.

Infants are categorized as low birthweight when they weigh less than 2,500 grams (5 pounds 8 ounces). Infants of low birthweight may have lower fat reserves and may have difficulty maintaining their body temperature. This reduces their rate of growth. Furthermore, they have a reduced reserve of iron in their body and are susceptible to anemia<sup>15</sup>. Low birthweight has remained at a relatively stable rate of prevalence in Missouri-WIC the past 3 years around 8.2%, which is slightly lower than the Healthy People 1998 baseline (9.0%) and higher than the target rate for Healthy People 2010 (5.0%).

Low birthweight infants were most prevalent among Black/African-American WIC participants, followed by Other/Unknown and White races/ethnicities (Fig. 18).



Insufficient records available to provide an accurate estimate for American Indian/Alaska Native participants in MO (not shown).

Figure 18. Prevalence of low birthweight ( $N=38,598$ ) and 'Full Term Low birthweight' ( $N=33,373$ ) among Missouri PNSS participants with regard to race/ethnicity. The Healthy People 2010 target is to reduce the rate of low birthweight to 5.0%. (Source: CDC PNSS report 2003, Table 23C). (Please note, scale has been truncated.)

About half of the low birthweight infants were delivered at full term (Fig. 18). Multiple births also tend to be born with low birthweight and made up 1.6% of the births (592 of 37,031 births). Cigarette smoking increases the risk of low birthweight independent of premature birth. Smokers in the WIC program exhibited higher rates of low birthweight births and full term low birthweight births than nonsmokers (Fig. 19).

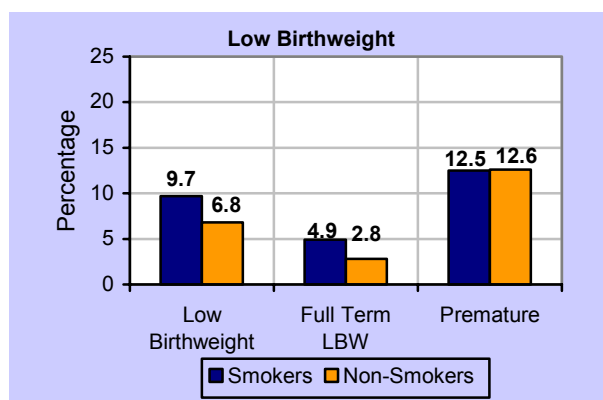


Figure 19. Percent of smokers and non smokers giving birth to Low birthweight, 'Full Term Low birthweight', and Premature infants. (Source: CDC PNSS report 2002, Table 13C). (Please note, scale has been truncated.)

## Prematurity

Prematurity (< 37 weeks gestation) and low birthweight are the leading causes of death during the first month of life. One in ten of all babies (WIC and non-WIC births) in Missouri are born premature. Deaths of premature infants account for 63.1% of all infant deaths in Missouri.<sup>16</sup> One in eight babies in the U.S. arrive prematurely.<sup>17</sup> If they survive, babies born prematurely have a greater risk of serious health problems because they weigh less (lower iron stores) and their organs are less developed. Very premature babies are at highest risk of death and disabilities such as mental retardation, cerebral palsy, lung and gastrointestinal problems, and vision and hearing loss.<sup>18</sup> Prematurity has been on the rise over the past decade. Since 1980, there has been a 27% rise in premature births in the U.S. The target for Healthy People 2010 is to reduce premature births in the U.S. to 7.6%.

Among the prenatal WIC participants in 2002 in Missouri, premature births made up 12.8% of live births, down just 0.3 percentage points from 13.1% in 2001, but still higher than in 2000 (12.4 %). Missouri WIC participants have a somewhat higher rate of premature births than the Nation overall (12.8% vs 11.2%) (Fig. 20).

Premature births were more prevalent among the young women (<17), older women (≥30), and Black/African-American and Other/Unknown race/ethnicity women (Fig. 21, Fig. 22).



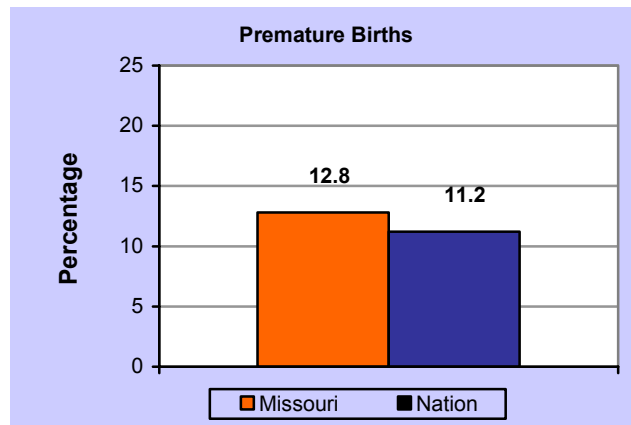
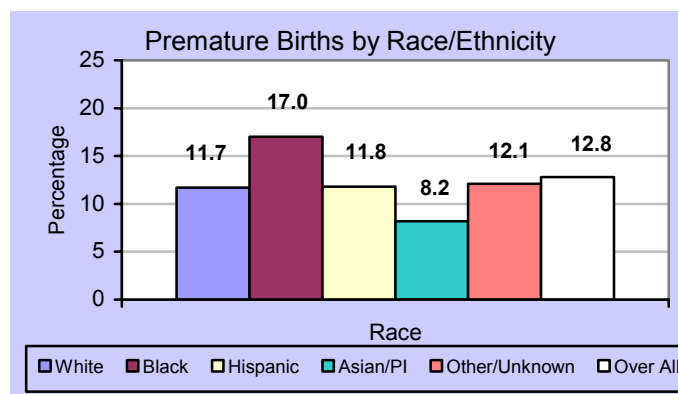


Figure 20. Prevalence of premature births in Missouri-WIC ( $N=38,726$ ), and the Nation ( $N=559,297$ ) 2002. The CDC target for Healthy People in 2010 is to reduce premature births in the U.S. to 7.6%. (CDC PNSS report 2003, Table 19C, CDC PNSS report 2002, Table 2D). (Please note, scale has been truncated.)



Insufficient records available to provide a reliable estimate for American Indian/Alaska Native participants..

Figure 21. Prevalence of premature birth among Missouri-WIC by Race/Ethnicity ( $N=38,726$ ). (CDC PNSS report 2003, Table 23C). (Please note, scale has been truncated.)

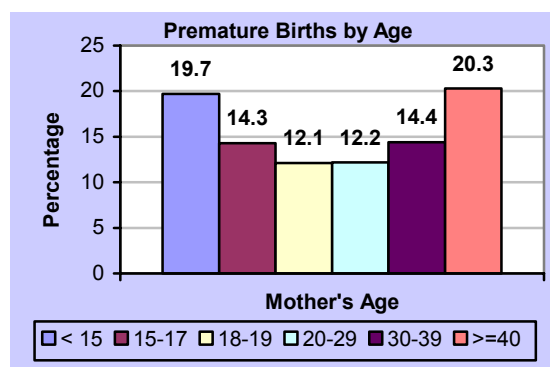


Figure 22. Prevalence of premature birth among Missouri-WIC by age group ( $N=35,880$ ). (CDC PNSS report 2002, Table 12C). (Please note, scale has been truncated.)

## CONCLUSIONS AND RECOMMENDATIONS

Encouraging trends are evident among Missouri women in WIC. Some of the risk factors displaying declining trends include: pregnancy among 15-17 year olds, underweight prepregnancy BMI, and postpartum smoking in the household.

In addition, two of the Healthy People 2010 goals are within reach. Premature births would need to decrease 5.2 percentage points (i.e., 40.6% decrease), and prenatal medical care would need to increase 17 percentage points (i.e., 22.9% increase). To achieve this over the next 8 years, premature births would need to decrease 0.6 percentage points on average each year. The rate of premature births has fluctuated an average of 0.4 percentage points each year over the past 5 years. Prenatal medical care would need to increase an average of 2.1 percentage points each year. Over the past 5 years, prenatal medical care increased an average of 1.2 percentage points each year. Among factors contributing to these rates, fluctuations of 0.4 percentage points per year have occurred. For example, changes in rates by 0.4 percentage points have been observed recently for WIC enrollment, smoking in the household, prepregnancy BMI, gestational weight gain, and low Hb.

Because 40% of WIC women are of age groups at highest risk for infant mortality and morbidity, prenatal care is very important in Missouri. All opportunities to make referrals between WIC and the medical community and vice versa should be encouraged, particularly in rural areas.

Premature births are 5.2 percentage points from the 2010 goal. Three factors have been cited that influence premature birth – mother's age, prepregnancy BMI, and low Hb. Though WIC has the means to make a difference in the level of low Hb among women, trends of the other two factors may slow progress. Although teen pregnancies are declining, pregnancies among women over 30, entering WIC are increasing. Older women are more likely to smoke during pregnancy, more likely to have overweight/obese prepregnancy BMIs, more likely to have multiple births, and more likely to gain less than ideal weight. This combination results in a tendency to have infants that are premature, low birthweight, and with medical complications. Teens tend to gain adequate or greater than ideal weight. However, teens are more likely to have low Hb, to smoke prior to pregnancy, and to have smokers in their homes.

Current WIC programs can continue to assist older mothers by screening for low Hb and providing healthy foods, by emphasizing the importance of adequate weight gain, and by encouraging smoking cessation. Further efforts may be needed to reach older women during the first trimester of pregnancy and to assist the population in maintaining healthy weight status in preparation for pregnancy.

## REFERENCES

- 1 National Center for Health Statistics, S. Taffel. Maternal Weight Gain and the Outcome of Pregnancy, United States, 1980. *Vital Health Statistics* Series 21 No 44 DHHS Publ. # PHS 86-1922. Public Health Service. Washington, U.S. Government Printing Office. June 1986
- 2 Freid V, Prager K, MacKay A, Xia H. Chartbook on Trends in the Health of Americans. Health, United States, 2003. Hyattsville, Maryland: National Center for Health Statistics. 2003. *Chartbook of Trends in the Health of Americans 2003*.
- 3 MICA 2002. Missouri Information for Community Assessment, DHSS, WIC Prenatal 2000-2002.
- 4 U.S. Department of Health and Human Services. *Healthy People 2010*. 2nd ed. With Understanding and Improving Health and Objectives for Improving Health. 2 vols. Washington, DC: U.S. Government Printing Office, November 2000.
- 5 Pregnancy and Newborn Health Education Center: Prenatal Care. 2004. March of Dimes Birth Defects Foundation. [http://www.marchofdimes.com/pnhec/159\\_513.asp](http://www.marchofdimes.com/pnhec/159_513.asp)
- 6 Institute Of Medicine (U.S.). Subcommittee on Nutritional Status and Weight gain During Pregnancy. 1990. Nutrition During Pregnancy: Part I, Weight Gain: Part II Nutrient Supplements / Subcommittee on Dietary Intake and Nutrient Supplements During Pregnancy, Committee on Nutritional Status During Pregnancy and Lactation, Food and Nutrition Board, Institute of Medicine, National Academy of Sciences. 480 p.
- 7 Perry, G.S., C. L. Zyrkowski, L.D. Clark, S. Yu. 1990. Pregnancy-Related Nutrition. pp. 119-128 IN Reproductive Health of Women, From Data to Action CDC's Public Health Surveillance for Women, Infants, and Children .
- 8 Prematurity: The Answers Can't Come Soon Enough. 2004. March of Dimes Birth Defects Foundation. [http://www.modimes.org/prematurity/5510\\_5810.asp](http://www.modimes.org/prematurity/5510_5810.asp)
- 9 Centers for Disease Control and Prevention. *Pregnancy nutrition surveillance, PNSS 1996 full report*. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 1998.
- 10 Institute of Medicine. Nutrition during Pregnancy: Part I. Weight gain. Part II. Nutrient supplements. Washington, DC. National Academy Press, 1990.as cited in Perry et al. Pregnancy-Related Nutrition. Reproductive Health of Women. From Data To Action: CDC'S Public Health Surveillance for Women, Infants, and Children.
- 11 Centers for Disease Control and Prevention. Recommendations to Prevent and Control Iron Deficiency in the United States. MMWR 1998;47(No. RR-3):29pp.

- 12 Centers for Disease Control and Prevention. Birth Defects. ABC's...Pregnancy Tips (A-Z). 3/3/2004. National Center on Birth Defects and Developmental Disabilities. <http://www.cdc.gov/ncbddd/bd/abc.htm>
- 13 Centers for Disease Control and Prevention . Health and Economic Impact: Smoking Cessation for Pregnant Women. [http://www.cdc.gov/tobacco/research\\_data/economics/health\\_econ\\_impact.pdf](http://www.cdc.gov/tobacco/research_data/economics/health_econ_impact.pdf)
- 14 Birth Defects: Frequently Asked Questions (FAQs) National Center on Birth Defects and Developmental Disabilities <http://www.cdc.gov/ncbddd/bd/faq2.htm>
- 15 March of Dimes Birth Defects Foundation. 2004 Professionals & Researchers. Quick Reference. Low Birthweight. [http://www.marchofdimes.com/professionals/681\\_1153.asp](http://www.marchofdimes.com/professionals/681_1153.asp)
- 16 Missouri Monthly Vital Statistics. 2002. Focus .. Preterm Births by Race and Age of Mother and Birth Order. MO DHSS-CHIME. Focus 36(5) 6p.
- 17 March of Dimes Birth Defects Foundation. 2003. Born Too Soon and Too Small in the United States. [http://peristats.modimes.org/prematurity.cfm?state\\_id=99&level=us](http://peristats.modimes.org/prematurity.cfm?state_id=99&level=us).
- 18 March of Dimes Birth Defects Foundation. Professionals & Researchers. Quick Reference and Fact Sheets. Preterm Birth. 2004. [http://www.marchofdimes.com/professionals/681\\_1157.asp](http://www.marchofdimes.com/professionals/681_1157.asp).